SEMICONDUCTOR STRUCTURE WITH DIFFERENT LATTICE CONSTANT MATERIALS AND METHOD FOR FORMING THE SAME

ABSTRACT OF THE DISCLOSURE

A semiconductor structure includes a substrate comprising a first relaxed semiconductor material with a first lattice constant. A semiconductor device layer overlies the substrate, wherein the semiconductor device layer includes a second relaxed semiconductor material with a second lattice constant different from the first lattice constant. In addition, a dielectric layer is interposed between the substrate and the semiconductor device layer, wherein the dielectric layer includes a programmed transition zone disposed within the dielectric layer for transitioning between the first lattice constant and the second lattice constant. The programmed transition zone includes a plurality of layers, adjoining ones of the plurality of layers having different lattice constants with one of the adjoining ones having a first thickness exceeding a first critical thickness required to form defects and another of the adjoining ones having a second thickness not exceeding a second critical thickness. Each adjoining layer of the plurality of layers forms an interface for promoting defects in the transition zone to migrate to and terminate on an edge of the programmed transition zone. A method of making the same is also disclosed.